



Error Budget

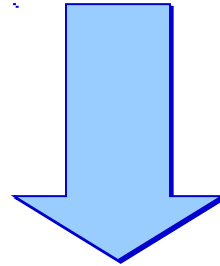
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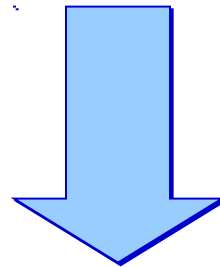
Error Budget



Science Requirements



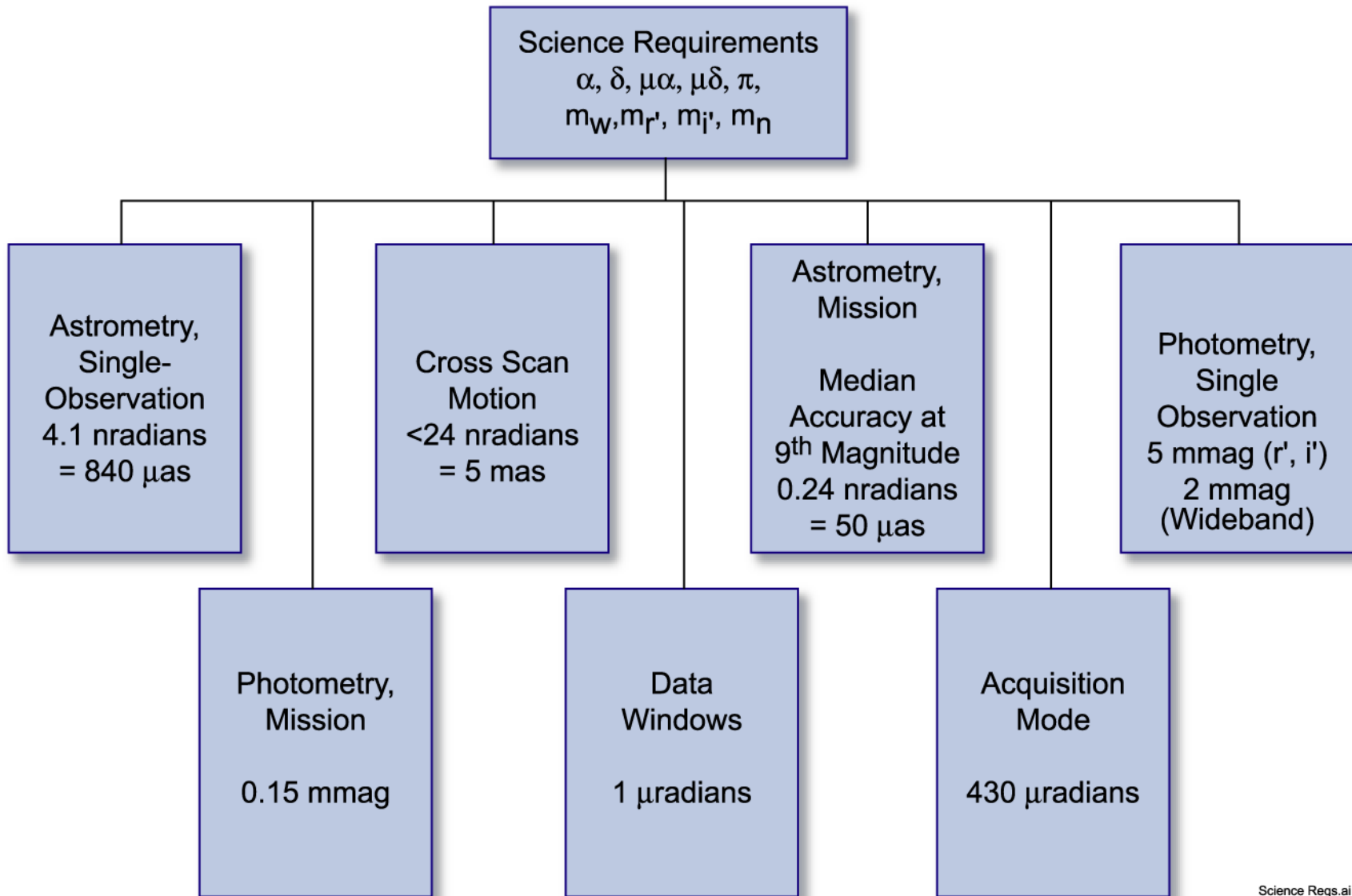
Error Budget



Mission Requirements Document



Science Requirements





Science Requirements - Astrometry



- **Precision of Individual Astrometric Measurements**
- **Accuracy of Mission Determinations of Position, Parallax, and Proper Motions of $50 \mu\text{as}$, $50 \mu\text{as}$ and $70 \mu\text{as/yr}$ for 5 Year Mission for 9th Magnitude**
- **Applies to Median Accuracy of Unconfused Sources**
- **Coverage Is for >98% of Sky**



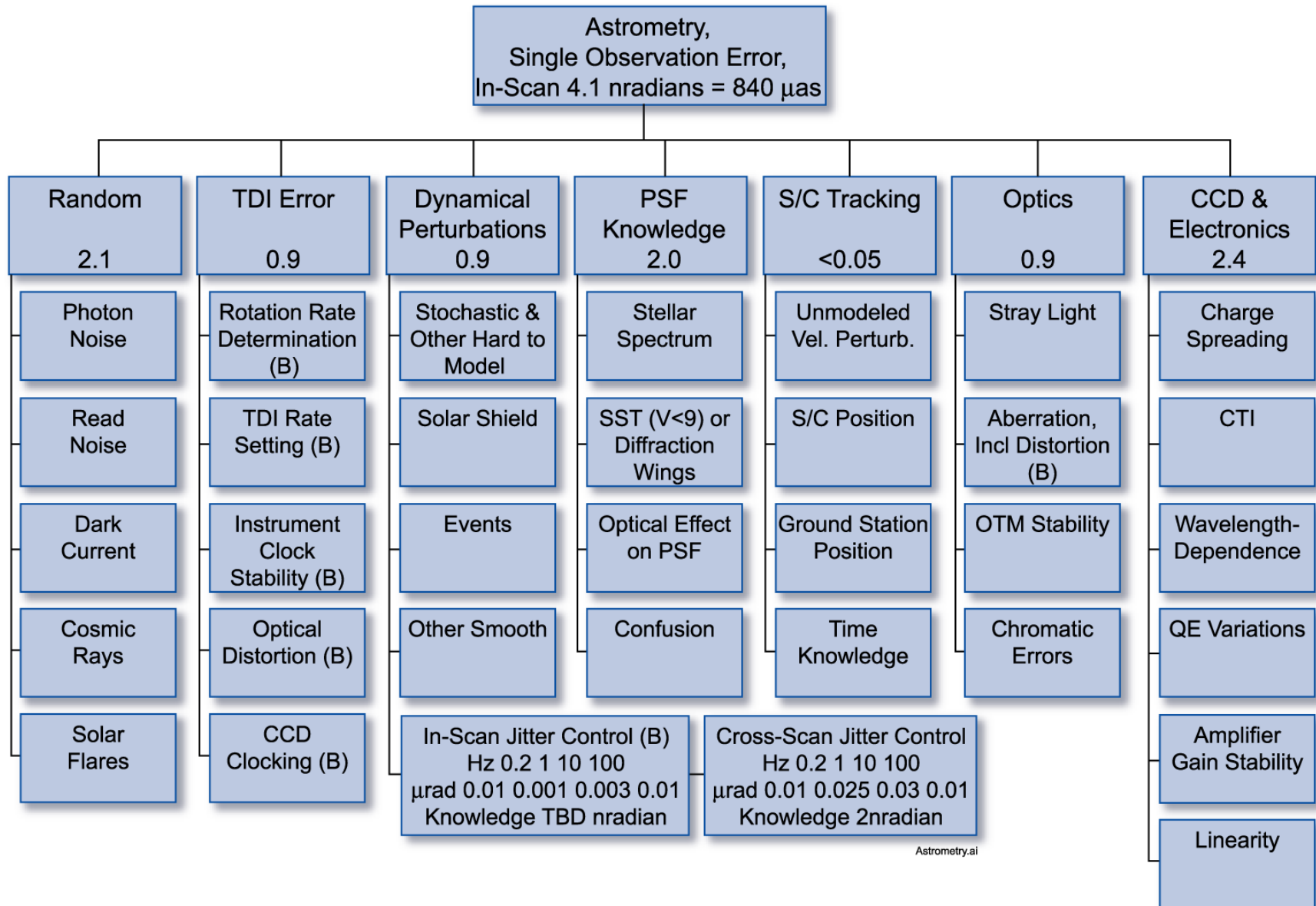
Error Budget Trees - Astrometry



- **Single Measurement Along Scan**
 - **Cross Scan Attitude Knowledge Requirements**
- **Mission**



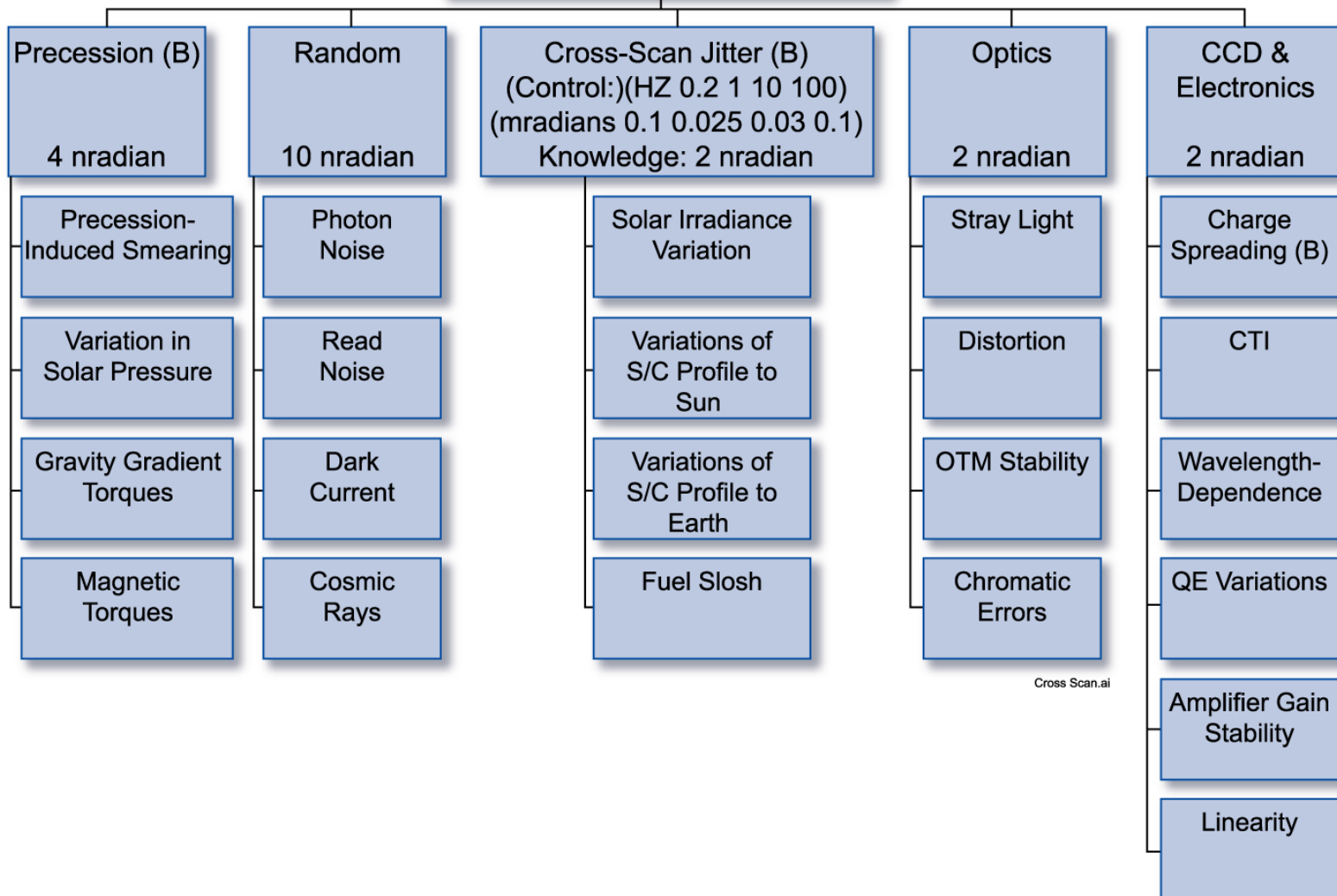
Astrometry, Single-Observation Error, In-Scan





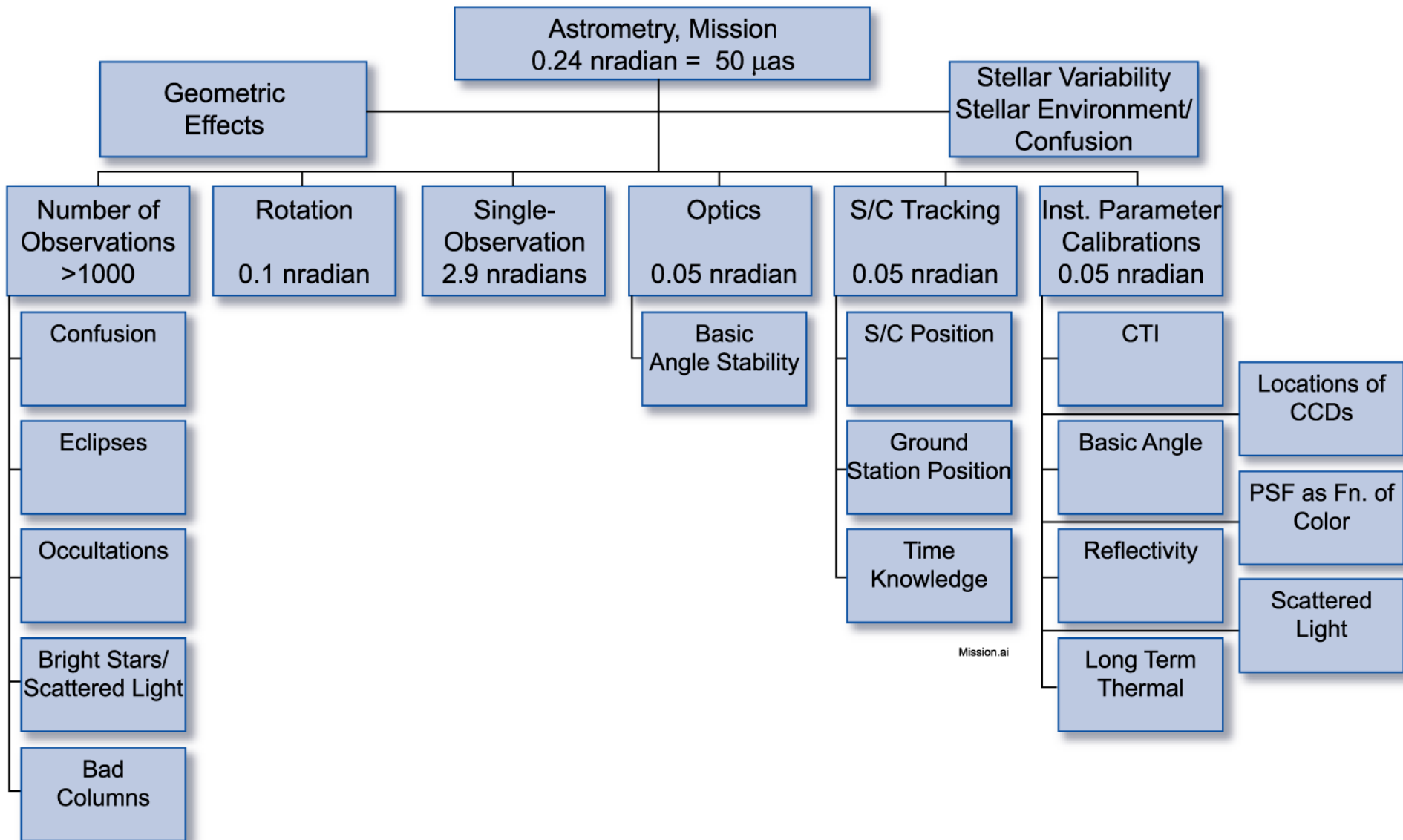
Astrometry, Cross-Scan, Unbinned Single Measurement

Astrometry, Cross-Scan, Unbinned
Single Measurement
Knowledge: <24 nradian = 5 mas





Astrometry, Mission





Astrometry, Single Measurement Accuracy



Vmag	Accuracy (mas)		
	A0	G2	M2
9	.84	.84	.84
10	.84	.84	.84
11	1.05	.88	.84
12	1.65	1.36	.94
13	2.74	2.20	1.45
14	1.80	3.76	2.36
15			



Astrometry, Mission Accuracy

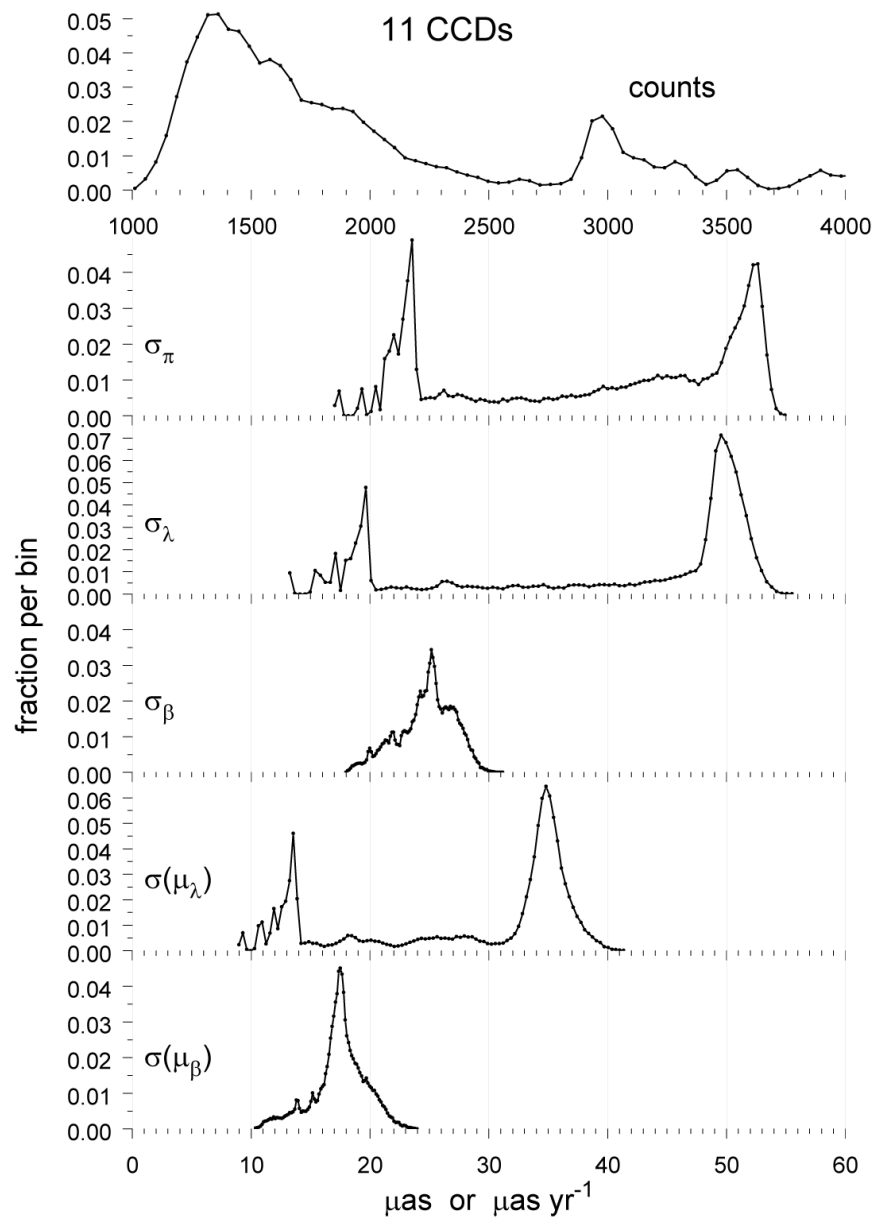


- **35 Degrees, 84.3 Degrees, 5 Years, 20 Days, 40 Min, 840 μ as, 5 Columns, 11 Astrometric Chips, 22322, 0.878 Deg Xscan FOV, 410x205 Grid**

	Min	Med	Avg	Max	50 μ as %
N	940	1588	1892	5127	—
Parallax (μas)	17	44	40	57	67
Long (μas)	13	50	41	57	55
Lat (μas)	18	26	25	32	100
Vlong (mas/yr)	9	35	29	44	100
Vlat (mas/yr)	11	18	18	25	100

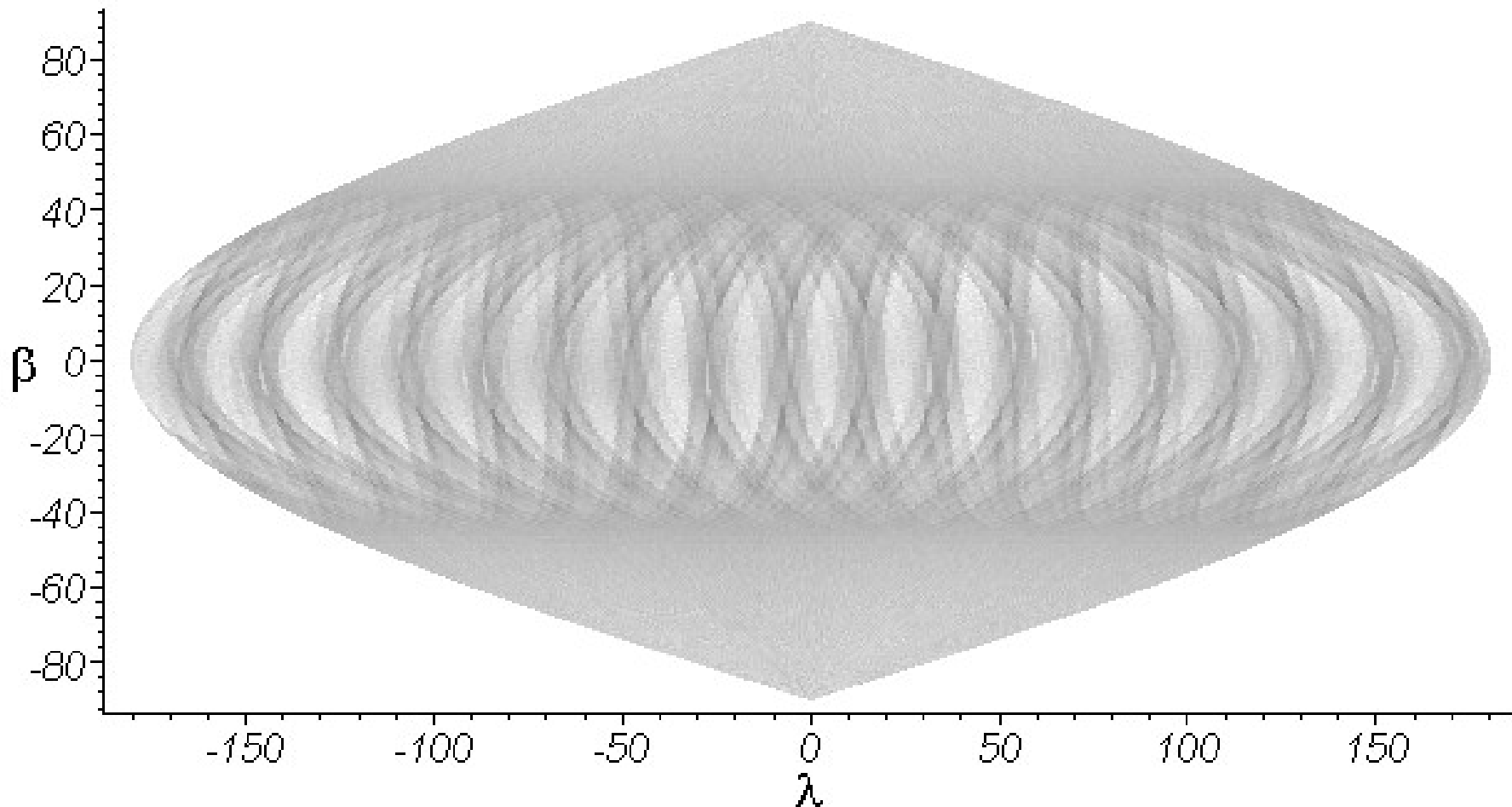


Astrometry, Mission Accuracy





Observation Density Distribution



**2.5 Year Mission, Sun - S/C Rotation Angle 45°, Spin
Period 40 Minutes, Precession Period 20 Days**



Science Requirements - Photometry



- **Precision of Individual Measurements in SDSS Filters to 2 mmag at $m_v = 9$ Degrading to 100 mmag at $m_v = 15$**
 - **Precision of Individual Measurements in Astrometric Filters to 2 mmag at $m_v = 9$ Degrading to 8 mmag at $m_v = 12$**
- **Mission SDSS System Precision of 1 mmag at $m_v = 9$ to 10 mmag at $m_v = 15$**
 - **Mission Astrometric Filter Precision of 1 mmag at $m_v = 9$ to 2 mmag at $m_v = 12$**



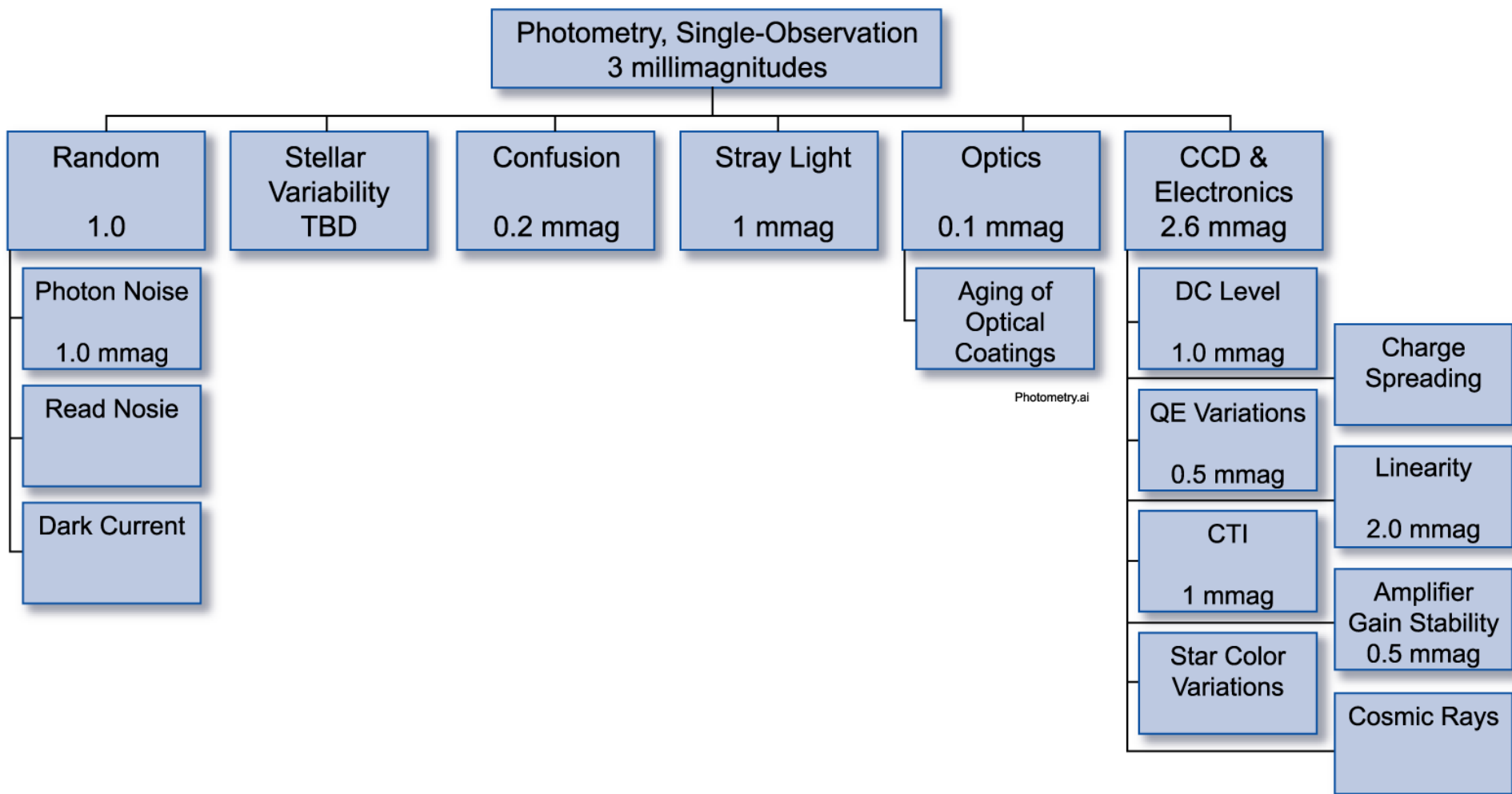
Error Budget Trees - Photometry



- **Single Observation**
 - **Astrometric CCDs**
 - **SDSS Filters**
- **Mission**

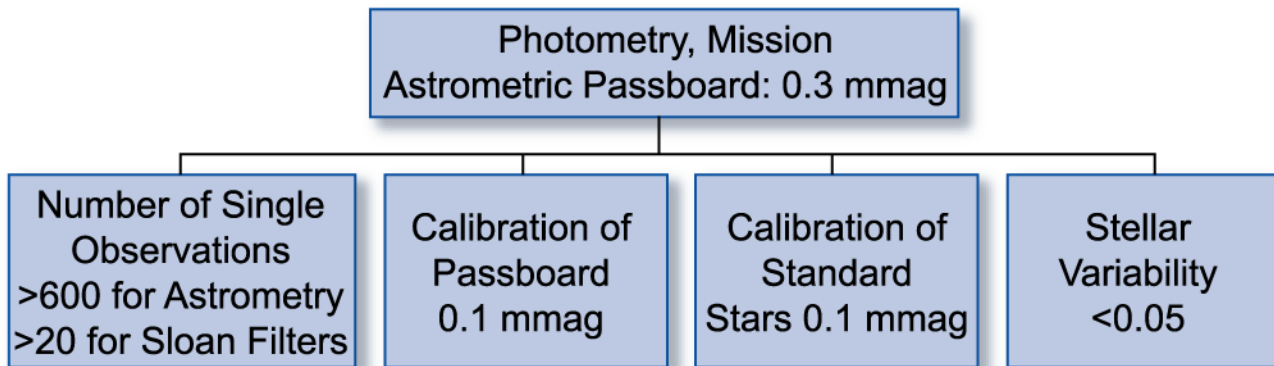


Photometric Errors, Single-Observation





Photometric, Mission



Photometry mission.ai



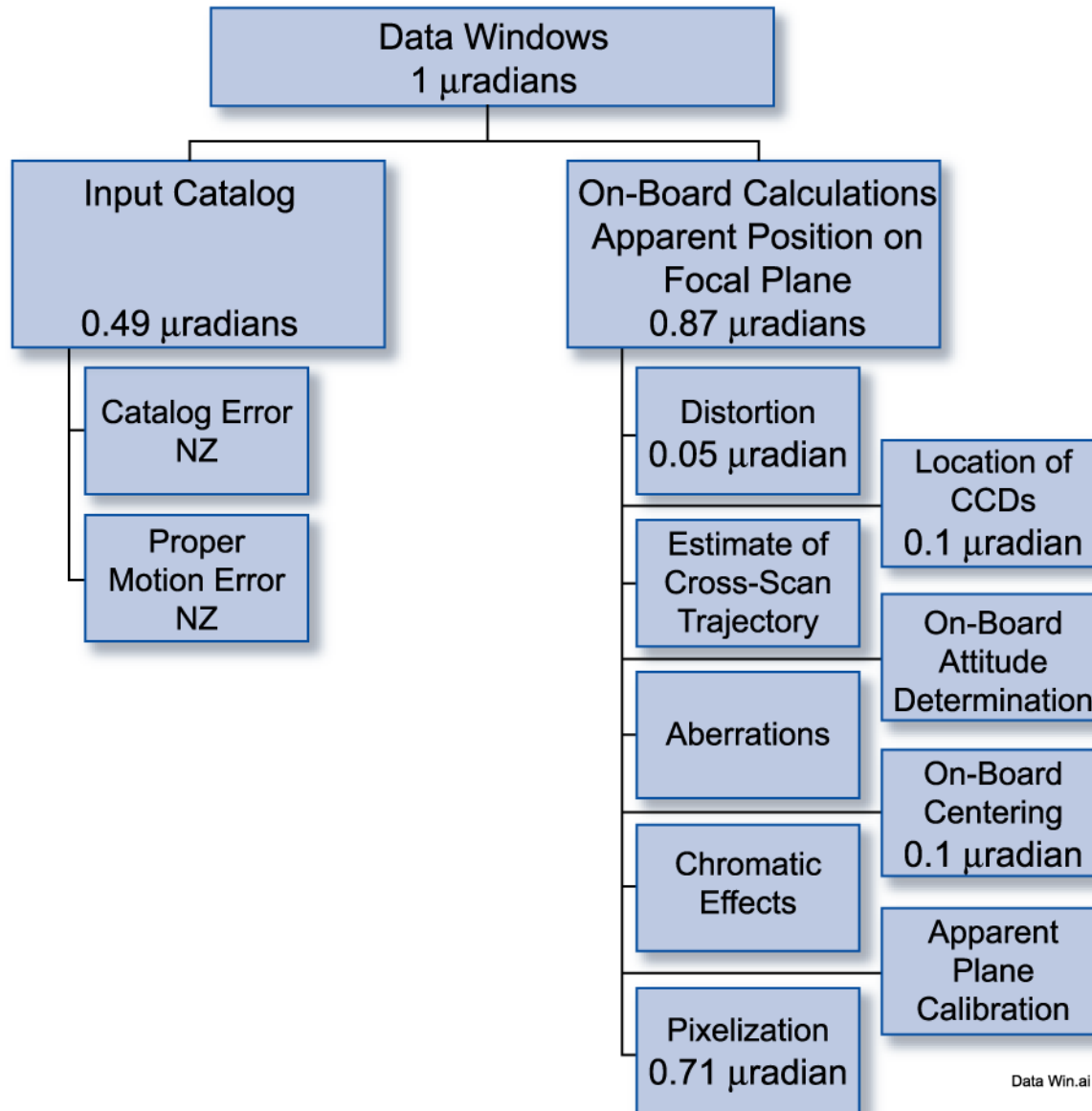
Alignment Error Tree



- **Data Window Placement**
- **Acquisition Mode**

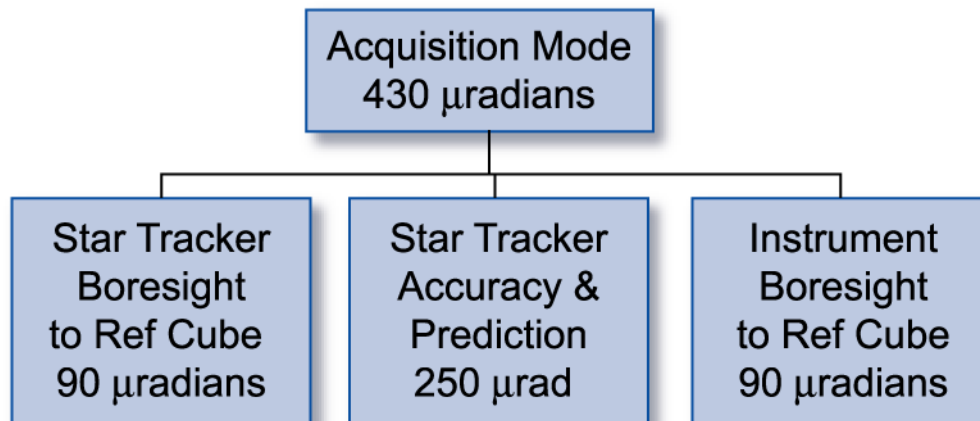


Data Window Placement





Acquisition Mode



Acquisition.ai



Summary



- **5 Year Mission Will Meet Science Requirements**



Backup



Astrometric Accuracy With 7 CCDs



- **35 Degrees, 84.3 Degrees, 5 Years, 20 Days, 40 Min, 840 μ as, 5 Columns, 7 Astrometric Chips, 21211, 0.878 Deg Xscan FOV, 410x205 Grid**

	Min	Med	Avg	Max	50 μ as %
N	624	1060	1261	3431	—
Parallax	21.3	53.5	49.2	69.8	45
Long	16.3	60.8	50.5	71.0	35
Lat	22.4	31.4	31.0	39.3	100
Vlong	11.0	42.4	35.6	52.5	99.8
Vlat	12.9	22.0	21.9	30.4	100



Astrometric Accuracy With 4 CCDs

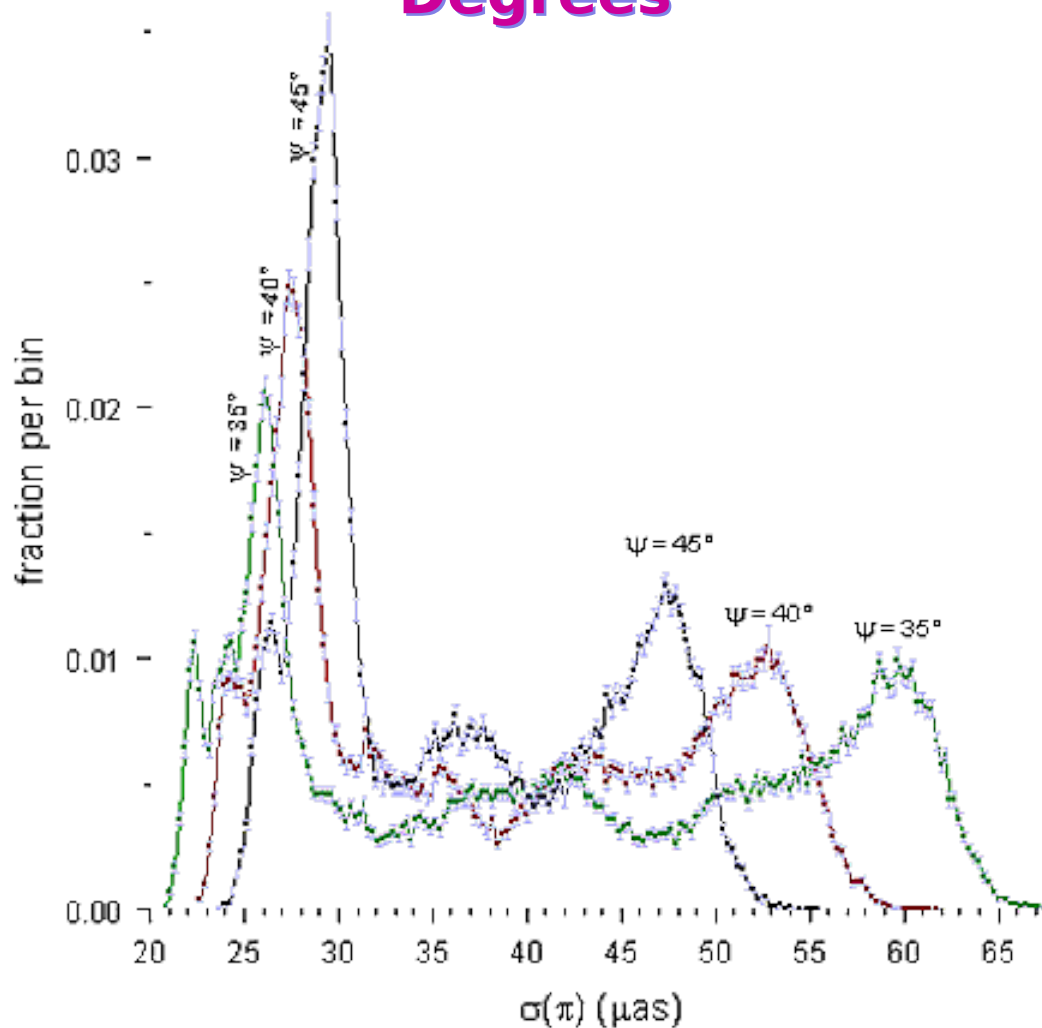


- **35 Degrees, 84.3 Degrees, 5 Years, 20 Days, 40 Min, 840 μ as, 5 Columns, 4 Astrometric Chips, 11101, 0.878 Deg Xscan FOV, 410x205 Grid**

	Min	Med	Avg	Max	50 μ as %
N	345	606	721	1968	—
Parallax	27.9	70.8	65.1	93.1	32
Long	21.5	80.3	66.9	96.1	28
Lat	29.5	41.5	41.0	52.2	99.9
Vlong	14.5	56.0	47.1	71.2	38
Vlat	16.9	29.1	29.0	40.8	100



Histogram of Parallax Error for Sun-Rotation Angle ψ of 35, 40, and 45 Degrees



Error Bars are 1σ , Assuming Poisson Statistics for Each Bin